Reply to 'Broaden research on the human dimensions of climate change'

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Correspondence: Environmental social science and a continuing conversation

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To the editor: A recent correspondence in *Nature Climate Change* (NCC)[1] by Noel Castree criticized the Collection 'Energy, climate and society'[2], joint with *Nature Energy,* as "symptomatic of a problem" in research on the human dimensions of global environmental change. We were stimulated to respond as in our view, the Collection is indeed part of the solution he advocates. We want to encourage readers to examine the entirety of the Collection, as papers published in *Nature Energy* include contributions from many of the fields the Correspondence sees as not represented.[3 4 5 6 7]

What is needed to generate useful insight on human-environment interactions is more than the inclusion of certain disciplines. A broad organization of the intellectual domain is required to attend to crucial problems of human well-being and the environment.[8 9] Disciplines organized to address the problems of the 19th and 20th centuries may not be adequate for that task. Rather, we agree with Castree that the research agenda must acknowledge and integrate the value and potential contributions from multiple sources of insight, including research in both the natural and social sciences, as well as sources from outside usual definitions of science.

The social sciences can offer improved understanding of the human causes, consequences, and responses to environmental challenges. But these efforts must interact with those of the natural sciences that are aimed at understanding the physical and ecological processes and impacts of climate change. [10] The social sciences need to be informed by other sciences, and also inform them.

Scientific work is needed to provoke discussion on how to address such challenges. Social science can help here, for example, by illuminating how and why people misunderstand climate change, analyzing and informing processes of deliberation and conflict resolution, identifying those most vulnerable to

climate change and affected by mitigation policies, etc. As Castree also suggests, these are not problem domains reducible to any single disciplinary approach.

Insights from studies that may not seek generalizability about social processes can also be important. For example, work on the history of scientific debates that prefigure the ones on climate change[11] and on the evolution of key ideas and normative frames, such as economic growth, can be of immense value.[12] So too can case-based research on ways to develop and implement effective environmental policy, prepare for and reduce damage from extreme events, and resolve environmental policy conflicts. This scholarship can offer valuable clues regardless of whether particular studies meet some *a priori* definition of "science." Legal scholarship can also offer valuable input, and so too can the arts, humanities, and literature.

Resolving problems of energy injustice and global change requires deep thinking about values and ethics as well as about facts. Drawing a bright line between science and non-science, between various epistemologies and ontologies, or between disciplines is less productive than seeking knowledge where it can be found and contemplating on what can be learned. As Castree intimates, the 'matters of fact' that science is so good at producing only become 'facts that matter' in decision-making because of science's engagement with society. If societies include groups with diverse values and circumstances, as nearly all societies do, then the implications of facts and their interpretation will vary across those groups.

The joint *NCC* and *NE* collection included papers in several of the above domains. As noted in the *Nature Energy* editorial[13], the Collection intended to illustrate the range of what environmental social science can contribute, but could not hope to definitively cover it all. The intent of our contributions was to open doors for the social sciences in the broader climate science community and showcase some of the knowledge being developed. We hope Castree, and others, continue to build on this progress.

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[1] Castree, N. Nat. Clim. Change 6, 731 (2016)
[2] http://www.nature.com/energyclimatesociety
[3] Paul C. Stern, Benjamin K. Sovacool & Thomas Dietz. Towards a science of climate and energy choices. Nature Climate Change 6, 547–555 (2016)

[4] Johan Schot, Laur Kanger & Geert Verbong. The roles of users in shaping transitions to new energy systems. Nature Energy 1, Article number: 16054 (2016)
[5] Paul C. Stern, Kathryn B. Janda, Marilyn A. Brown, Linda Steg, Edward L. Vine & Loren Lutzenhiser. Opportunities and insights for reducing fossil fuel consumption by households and organizations Nature Energy 1, Article number: 16043 (2016)
[6] David Bidwell. Thinking through participation in renewable energy decisions. Nature Energy 1 2016.
[7] Benjamin K. Sovacool, Raphael J. Heffron, Darren McCauley & Andreas Goldthau. Energy decisions reframed as justice and ethical concerns. Nature Energy 1, Article number: 16024 (2016)
[8] National Research Council. 1992. *Global Environmental Change: Understanding the Human Dimensions.* Washington: National Academy Press.
[9] Kates, Robert W, William C Clark, Robert Corell, J Michael Hall, Carlo Jaeger, Ian Lowe, James J McCarthy, Hans-Joachim Schellnhuber, Bert Bolin, Nancy M Dickson, Sylvie Faucheux, Gilberto C Gallopin, Arnulf Grubler, Brian Huntley, Jill Jager, Narpat S Jodha, Roger E Kasperson, Akin Mabogunje, Pamela Matson, Harold Mooney, Berrien III Moore, Timothy O'Riordan, and Uno Svedin. 2001. "Sustainability Science." *Science* 292:641-642.
[10] U.S. National Research Council. 2010. *Advancing the Science of Climate Change*. Washington, D.C.: National Academies Press.
[11] Michaels, David. 2008. *Doubt is Their Product: How Industry's Assault on Science Threatens Your Health*. New York: Oxford University Press.
[12] Worster, Donald. 2016. *Shrinking the Earth: The Rise and Decline of American Abundance*. New York: Oxford University Press.
[13] Nat. Energy 1, Article number: 16069 (2016) http://www.nature.com/articles/nenergy201669